

1 CLAIMS:

2 What is claimed is:

3 1. An electronic watermarking system, for embedding
4 additive information in digital data, for which one frame
5 is defined as including N samples extracted from digital
6 data and a current frame is defined as a frame that is
7 overlapped by M samples ($0 < M \leq N/2$) of a preceding frame,
8 comprising:

9 (1) a frequency domain transformation unit, for
10 multiplying a frame extracted from digital data by a
11 window function, and for using the results to perform a
12 Fourier transform and thus obtain a frequency component
13 for said digital data;

14 (2) a frequency domain embedding unit, for employing
15 bit information for additive information, and a frequency
16 band for said frequency component to change the amplitude
17 of said frequency component in said digital data obtained
18 by said frequency domain transformation unit;

19 (3) a time domain transformation unit, for
20 performing an inverse Fourier transform to return, to a
21 time domain signal, said frequency component whose
22 amplitude has been changed by said frequency domain
23 embedding unit; and

24 (4) an additive information embedding frame
25 generator, for multiplying, by a window function, said
26 time domain signal obtained by said time domain
27 transformation unit, and for superimposing overlapped

1 frames to generate a frame wherein said additive
2 information is embedded.

3 2. An electronic watermarking system according to claim
4 1, wherein, to change said amplitude of said frequency
5 component of said digital data, said frequency domain
6 embedding unit (2) employs bit information for additive
7 information and the values of a mask, determined in
8 advance in accordance with a frequency band, with which
9 said frequency component is to be increased or decreased.

10 3. An electronic watermarking system according to claim
11 2, wherein the values of said mask corresponding to all
12 the frequencies included in one frequency band are
13 equalized.

14 4. An electronic watermarking system according to claim
15 2 or 3, wherein, as the frequency increases, the width of
16 said frequency band is extended.

17 5. An electronic watermark detection system, for
18 detecting additive information embedded in digital data,
19 comprising:

20 (1) a frequency domain transformation unit, for
21 multiplying a frame extracted from digital data by a
22 window function, and for performing a Fourier transform
23 to obtain a frequency component from said digital data;

24 (2) an amplitude storing unit, for obtaining
25 amplitudes for said frequency components acquired by said
26 frequency domain transformation unit, and for storing a

1 number of said amplitudes that equals a predetermined
2 frame count;

3 (3) a cycle synchronization unit, for employing an
4 amplitude value stored by said amplitude storing unit to
5 designate a bit detection start frame; and

6 (4) a bit detector, for detecting bit information
7 from embedded additive information beginning at said bit
8 detection start frame obtained by said cycle
9 synchronization unit.

10 6. An electronic watermark detection system according to
11 claim 5, wherein said frequency domain transformation
12 unit (1) uses the shorter length of said frame than the
13 length when said additive information is embedded.

14 7. An electronic watermark detection system according to
15 claim 5, wherein, in order to designate said bit
16 detection start frame by referring to said amplitude
17 values, said cycle synchronization unit (3) employs
18 calculation results obtained by using the values of a
19 mask that defines, in advance, a frequency component
20 increase or decrease.

21 8. An electronic watermarking method, for embedding
22 additive information in digital data, whereby one frame
23 is defined as including N samples extracted from digital
24 data, and a current frame is defined as a frame that is
25 overlapped by M samples ($0 < M \leq N/2$) of a preceding frame,
26 comprising the steps of:

27 (1) extracting one frame as a current frame from

- 1 digital data;
2 (2) multiplying said current frame by a window
3 function;
4 (3) performing a Fourier transform for the resultant
5 current frame to obtain a frequency component for said
6 current frame;
7 (4) changing an amplitude of said frequency
8 component in accordance with bit information for additive
9 information;
10 (5) performing an inverse Fourier transform for the
11 resultant frequency component;
12 (6) multiplying, by said window function, said
13 frequency component obtained using said inverse Fourier
14 transform; and
15 (7) adding an (N-M)-th sample, from the end of a
16 preceding frame processed in the same manner as said
17 steps (1) to (6), to an M-th sample, from the head of
18 said current frame processed at said step (6), and
19 generating one new frame including N samples.
- 20 9. An electronic watermarking method according to claim
21 8, wherein, at said step (4) of changing said amplitude
22 of said frequency component, said amplitude is changed by
23 employing bit information for additive information and
24 the values of a mask, determined in advance in accordance
25 with a frequency band, with which said frequency
26 component is to be increased or decreased.
- 27 10. An electronic watermarking method according to claim
28 9, wherein the values of said mask corresponding to all